PROFIBUS and PROFINET for wastewater pumping systems

CIM 150 / CIU 152 for PROFIBUS DP
CIM 500 / CIU 502 Ethernet for PROFINET IO

Functional profile and user manual

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Original functional profile and user manual.

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1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Introduction

2.1 About this functional profile

This functional profile describes the:

- CIM 150 PROFIBUS DP
- CIM 500 Ethernet for PROFINET IO
- CIU 152 PROFIBUS DP
- CIU 502 Ethernet for PROFINET IO

for the following Grundfos products:

- Grundfos Dedicated Controls (CU 361 and CU 362)
- Grundfos DP, EF, SL1, SLV and SEG AUTO$_{ADAPT}$ wastewater pumps.

In the following, the supported products are referred to as "wastewater system".

The two supported controllers CU 361 and CU 362 are referred to as CU 36X.

The data in this document are subject to change without prior notice. Grundfos cannot be held responsible for any problems caused directly or indirectly by using information in this functional profile.

2.2 PROFIBUS DP-V0

The PROFIBUS DP interface conforms to the PROFIBUS DP-V0 standard for cyclic data transmission.

The option of setting the PROFIBUS DP address via bus is not supported as the CIM 150 has two switches for setting the address.

2.3 PROFIBUS DP-V1

Only the diagnostic part and the extra three bytes of parameterisation data are supported. Acyclic data transmission is not supported.

2.4 Assumptions

This functional profile assumes that the reader is familiar with commissioning and programming of PROFIBUS and PROFINET devices.

2.5 Definitions and abbreviations

ARP	Address Resolution Protocol. Translates IP-addresses to MAC-addresses
Auto-MDIX	Ensures that both crossover cable types and non-crossover cable types can be used.
CAT5	Ethernet cable type: Has 4 twisted pairs of wires.
CAT5e	Enhanced CAT5 cable with better performance.
CAT6	Cable with very high performance.
CIM	Communication Interface Module.
CIU	Communication Interface Unit.
CRC	Cyclic Redundancy Check, a data error detection method.
CU 36X	Grundfos Control Unit for Dedicated Controls (CU 361 and CU 362).
DHCP	Dynamic Host Configuration Protocol. Used to configure network devices so that they can communicate on an IP network.
DNS	Domain Name System. Used to resolve host names to IP addresses.
Enumeration	List of values.
GENIbus	Proprietary Grundfos fieldbus standard.
GENIpro	Proprietary Grundfos fieldbus protocol
Grundfos GO	A Grundfos handheld remote control device for controlling Grundfos products via infrared or radio. Based on smart phone technology.
HTTP	Hyper Text Transfer Protocol. The protocol commonly used to navigate the world wide web.
IANA	Internet Assigned Numbers Authority.
IP	Internet Protocol
LED	Light-Emitting Diode.
MAC	Media Access Control. Unique network address for a piece of hardware.
MP 204	Grundfos Motor Protector
Ping	Packet InterNet Groper. A software utility that tests connectivity between two TCP/IP hosts.
R100	Grundfos handheld infrared remote control.
SELV	Separated or Safety Extra-Low Voltage.
SELV-E	Separated or Safety Extra-Low Voltage with Earth connection.
SMA	SubMiniature version A. Coaxial radio signal cable connection standard.
SMTP	Simple Mail Transfer Protocol
SNTP	Simple Network Time Protocol. Used for clocks synchronization between computer systems.
TCP	Transmission Control Protocol. Protocol suitable for Internet communication and Industrial Ethernet communication.
TCP/IP	Transmission Control Protocol/Internet Protocol. Protocol suitable for Internet communication.
Transmission speed	Bits transferred per second, bits/s.
URL	Uniform Resource Locator. The address used to connect to a server.
UTC	Coordinated Universal Time, the primary time standard by which the world regulates clocks and time.
UTF-8	Unicode Transformation Format (character encoding).
VPN	Virtual Private Network.A network using the Internet to connect nodes. These systems use encryption and other security mechanisms to ensure that only authorised users can access the network and that the data cannot be intercepted.

3. System description

The system diagrams provide an overview for the different technologies of how to use the CIM module or CIU unit for connecting waste-water pumps to a PROFIBUS or PROFINET network.

CIM solution, Dedicated Controls (CU 36X)

The Grundfos Dedicated Controls CU 36X control unit can be connected to up to six Grundfos wastewater pumps. It offers status information as well as control and monitoring of a wastewater pit via a user-friendly control panel with display.

The CIM 150/500 is an add-on communication module to be fitted in the CU 36X, using a 10-pin connection. This enables communication with a PLC, SCADA system, etc.

CIU solution, AUTO$_{ADAPT}$ wastewater pumps

The CIU XX2 unit constitutes a communication interface to a system consisting of up to four Grundfos DP, EF, SL1, SLV or SEG AUTO$_{ADAPT}$ wastewater pumps installed in one or more pump pits. The pumps connect to the CIU XX2 running communication over a separate pair of wires.

Each pump has an integrated pressure sensor that enables it to monitor and control the water level in the pump pit according to a common reference level and an intermittent operation scheme. By monitoring the water level, the pump will obtain enough information to know when to start and stop pumping.

The CIU XX2 unit is not involved in the control of the water level (starting and stopping of pumps), but merely provides the interface necessary for the following:

- Configuration of the pump parameters required for the level control.
- Online monitoring of pit and pump values.
- Individual (manual) control of each pump (forced start/stop and pump-down).
- Obtaining of measured and logged data that is valuable for pump service and pit optimisation.

The CIU XX2 can communicate with a Grundfos handheld device (R100 or Grundfos GO Remote). This is not shown in the pictures and is not discussed further in this manual.

3.1 PROFIBUS DP (CIM 150)

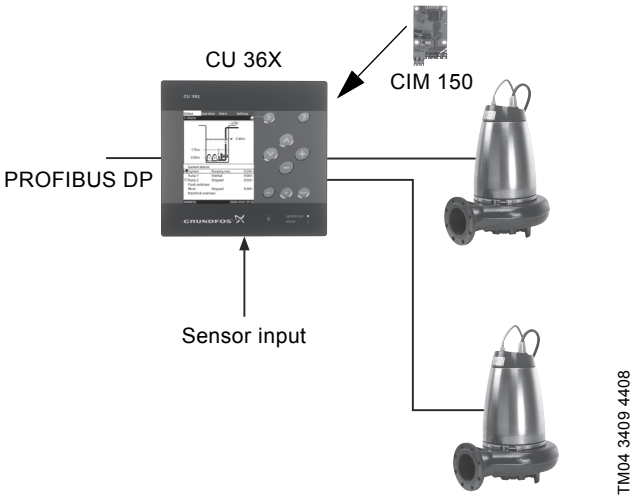

Fig. 1 CIM 150 solution for Dedicated Controls. Up to six pumps can be connected to CU 36X.

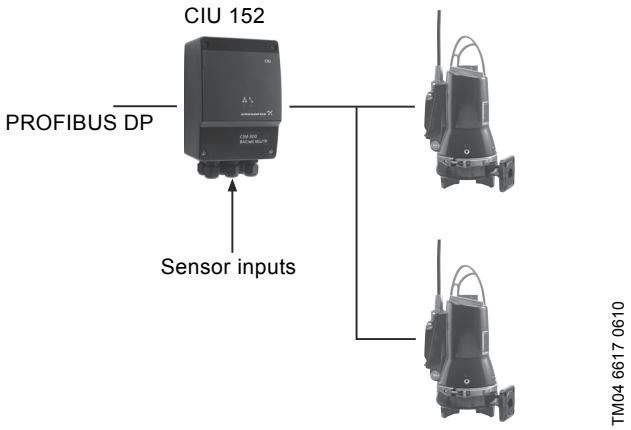

Fig. 1 CIU 152 solution for Grundfos DP, EF, SL1, SLV and SEG AUTO$_{ADAPT}$ pumps

3.2 PROFINET IO (CIM 500)

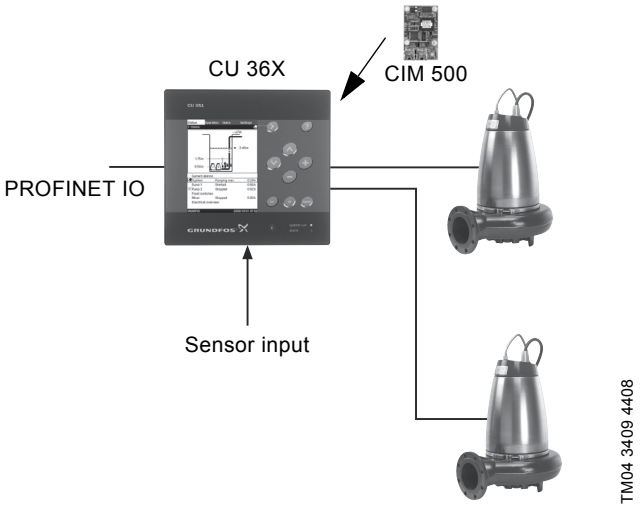

Fig. 2 CIM 500 solution for Dedicated Controls. Up to six pumps can be connected to CU 36X.

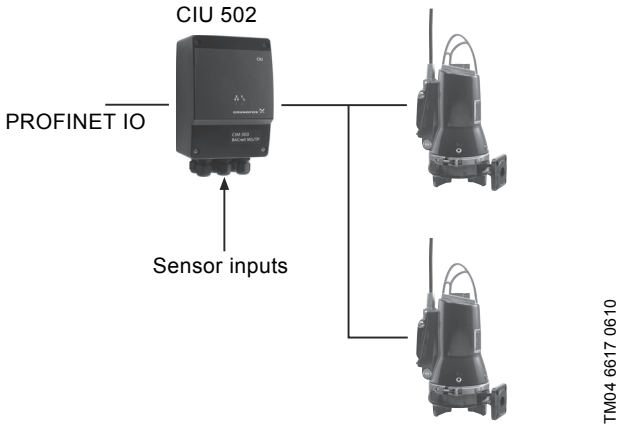

Fig. 3 CIU 502 solution for Grundfos DP, EF, SL1, SLV and SEG AUTO$_{ADAPT}$ pumps

4. Specifications

4.1 CIM module general data

General data	Description	Comments
Ambient humidity	30 % to 95 %	Relative, non-condensing.
Operating temperature	-20 °C to +45 °C	
Storage temperature	-25 °C to +70 °C	
GENIbus visual diagnostics	LED2	Will be in one of these states: Off, constantly green, flashing red, constantly red. See section *5.6* for PROFIBUS DP and section *6.5* for PROFINET IO.
Power supply (CIU)	24-240 V	Located in the CIU.
GENIbus connection type (CIU)	RS-485, 3-wire + screen	Conductors: A, B and Y.
CIU box enclosure class	IP54	
CIU box dimensions (H x W x D)	182 x 108 x 82 mm	

4.2 CIM 150 PROFIBUS DP

The table below provides an overview of the specifications for the Grundfos CIM 150 and CIU 152. For further details, please refer to the specific sections of this functional profile.

General data	Description	Comments
PROFIBUS implementation class	DP-V0	Intelligent pump profile.
PROFIBUS connector	Screw-type terminal	A, B, DGND, VP (+5 V).
PROFIBUS connection type	RS-485, two-wire	Conductors: A, B.
Maximum cable length	100 metres at 12 Mbits/s	Corresponds to 328 feet. See section *5.3.1 Data transmission rates and cable length*.
Slave address	1-126	Set via rotary switches SW3 and SW4. See section *5.4 Setting the PROFIBUS address*.
Line termination	On or off	Set via DIP switches SW1 and SW2. See section *5.5 Termination resistors*. Auto detected
Recommended cable cross sectional cobber area	0.20 - 0.25 mm^2	AWG24 or AWG23
Supported transmission speed	9.6 Kbits/s to 12 Mbits/s	Auto detected.
PROFIBUS visual diagnostics	LED1	Off, constantly green, flashing red, constantly red. See section *5.6 Status LEDs*.
Maximum number of PROFIBUS devices at a physical network segment	32	Up to 125 devices if repeaters are used (physically segmented network).

4.3 CIM 500 PROFINET IO

The table below provides an overview of the specifications for the Grundfos CIM 500 and CIU 502 Ethernet for PROFINET IO. For further details, please refer to the specific sections of this functional profile.

Modbus TCP specifications	Description	Comments
Application layer	DHCP, HTTP, Ping, FTP, SMTP, SNTP, PROFINET IO	Rotary switch in position 0.
Transport layer	TCP	
Internet layer	Internet protocol V4 (IPv4)	
Link layer	ARP, Media Access Control (Ethernet)	
Ethernet cable	Screened/unscreened, twisted-pair cables, CAT5, CAT5e or CAT6	Supports auto cable-crossover detecting (Auto-MDIX).
Maximum cable length	100 metres at 10/100 Mbits/s	Corresponds to 328 feet.
Transmission speed	10 Mbits/s, 100 Mbits/s	Auto-detected.
Industrial Ethernet protocols	PROFINET IO, Modbus TCP	Selected with rotary switch, section 6.2.

5. PROFIBUS DP, CIM 150 setup

5.1 PROFIBUS bus topology

The PROFIBUS-preferred bus topology is daisy chaining as illustrated in fig. 4. The end devices of a physical bus segment must be terminated (LT = Line Termination). Each device must have a unique physical address [1-126]. Up to 32 PROFIBUS devices can be connected to a bus segment, and by using a repeater another 32 devices can be connected. This can be repeated until the maximum number of addresses are used. Make sure that each device is connected to a proper earth potential.

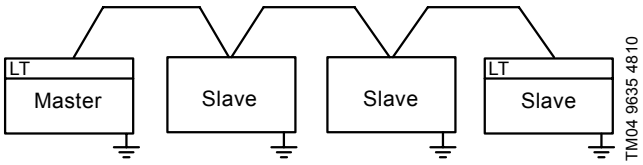

Fig. 4 Example of PROFIBUS bus segment with line termination

5.2 CIM 150 PROFIBUS module

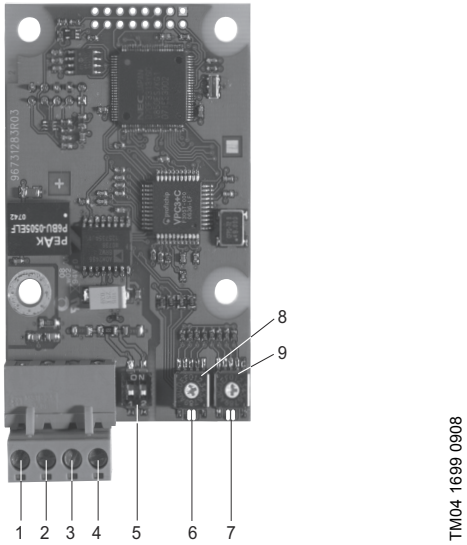

Fig. 5 CIM 150 PROFIBUS module

Pos.	Designation	Description
1	B (RxD/TxD-P)	PROFIBUS terminal B (positive data signal)
2	A (RxD/TxD-N)	PROFIBUS terminal A (negative data signal)
3	DGND	PROFIBUS terminal DGND (only for external termination)
4	VP	+5 VDC (only for external termination)
5	SW1/SW2	On/off switches for termination resistors
6	LED1	Red/green status LED for PROFIBUS communication
7	LED2	Red/green status LED for GENIbus communication between the CIM 150 and the wastewater system
8	SW3	Hex switch for setting the PROFIBUS address (four most significant bits)
9	SW4	Hex switch for setting the PROFIBUS address (four least significant bits)

Note ***The power supply (pos. 4, fig. 5) must only be used for external termination.***

5.3 Connecting the PROFIBUS

5.3.1 Data transmission rates and cable length

Grundfos recommends to use a cable according to IEC 61158.

Example

Siemens, 6XV1 830-0EH10.

Kbits/s	Maximum cable length
	[m/ft]
9.6	1200/4000
19.2	1200/4000
45.45	1200/4000
93.75	1000/3300
187.5	1000/3300
500	400/1300
1500	200/660
3000	100/330
6000	100/330
12000	100/330

Fitting the cable

See fig. 6.

1. Connect the red conductor(s) to terminal B (pos. 1).
2. Connect the green conductor(s) to terminal A (pos. 2).
3. Connect the cable screens to earth via the earth clamp (pos. 3).

Note ***For maximum safety and reliability, connect the cable screen to earth via the earth clamp, and make sure that all CIU 150 units are properly earthed via the mains supply earth wire.***

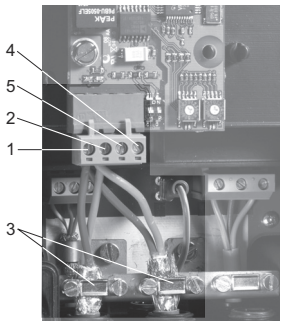

Fig. 6 Connecting the PROFIBUS

Pos.	Description
1	PROFIBUS terminal B
2	PROFIBUS terminal A
3	Earth clamp
4	+5 VDC
5	DGND

5.4 Setting the PROFIBUS address

The CIM 150 PROFIBUS module has two hexadecimal rotary switches for setting the PROFIBUS address. The two switches are used for setting the four most significant bits (SW3) and the four least significant bits (SW4), respectively. See fig. 7.

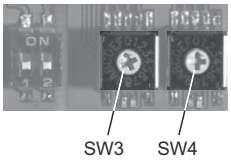

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Fig. 7 Setting the PROFIBUS address

The table below shows examples of PROFIBUS address settings.

Note ***The PROFIBUS address must be set decimally from 1 to 126. The address 126 is normally used for special purposes and should not be used.***

PROFIBUS address	SW3	SW4
8	0	8
20	1	4
31	1	F
126	7	E

A restart of the CIM/CIU 150 has to be performed for a PROFIBUS address change to take effect.

For complete overview of the PROFIBUS addresses, see section *11. PROFIBUS address*.

5.5 Termination resistors

The termination resistors are fitted on the CIM 150 PROFIBUS module. See fig. 8.

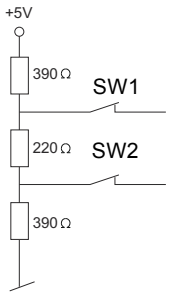

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Fig. 8 Internal termination resistors

The CIM 150 has a DIP switch with two switches (SW1 and SW2) for cutting the termination resistors in and out. Figure 9 shows the DIP switches in cut-out state.

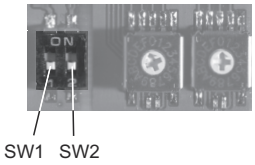

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Fig. 9 Cutting termination resistors in and out

DIP switch settings

Status	SW1	SW2
Cut in	ON	ON
Cut out	OFF	OFF
Undefined state	ON	OFF
	OFF	ON

Note ***To ensure stable and reliable communication, it is important that only the termination resistors of the first and last units in the PROFIBUS network are cut in.***

5.6 Status LEDs

The CIM 150 PROFIBUS module has two LEDs. See fig. 5.

- Red/green status LED (LED1) for PROFIBUS communication.
- Red/green status LED (LED2) for GENIbus communication between the CIM 150 and the connected wastewater system.

LED1

Status	Description
Off.	The CIM 150 has been switched off.
Constantly green.	The CIM 150 is ready for PROFIBUS data transmission (Data Exchange State).
Constantly red.	CIM 150 module fault. The CIM 150 does not support the connected wastewater system.
Flashing red.	Wrong or missing PROFIBUS configuration or no contact to the PROFIBUS master.

LED2

Status	Description
Off.	The CIM 150 is switched off.
Constantly green.	GENIbus communication between the CIM 150 and the wastewater system is OK.
Constantly red.	The CIM 150 does not support the connected wastewater system.
Flashing red.	No GENIbus communication between the CIM 150 and the wastewater system.

Note ***During start-up, there may be a delay of up to 5 seconds before the LED2 status is updated.***

5.7 Communication watchdog

The state of the PROFIBUS communication watchdog can be changed with a PROFIBUS commissioning tool, e.g. Siemens Simatic Manager. If the watchdog is enabled, all bits in the PROFIBUS output modules are automatically set to "0" if the PROFIBUS communication is broken.

As a result, the E-pump will be set to local mode and then be operating according to the local operating mode, local setpoint and local control mode.

5.8 Reaction to PLC "Stop button"

If the PLC is stopped by the operator, all output registers will be set to "0".

As a result, the control bit RemoteAccessReq will be cleared, and the wastewater system will be set to local mode.

6. PROFINET IO, CIM 500 setup

6.1 Connecting the Ethernet cable

Warning

The CIM 500 must only be connected to SELV or SELV-E circuits.

RJ45 plugs and Ethernet cable must be used. The cable shield must be connected to protective earth at both ends.

Note

It is important to connect cable shield to earth through earth clamp or to connect cable shield to earth in the connector.

The CIM 500 is designed for flexible network installation; the built-in two port switch makes it possible to daisy chain from product to product without the need of additional Ethernet switches. The last product in the chain is only connected to one of the Ethernet ports. Each Ethernet port has its own MAC address.

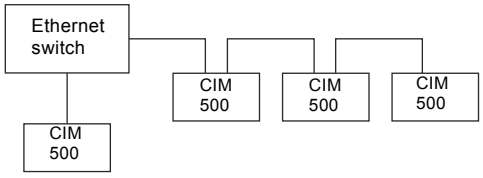

Fig. 10 Example of Industrial Ethernet network

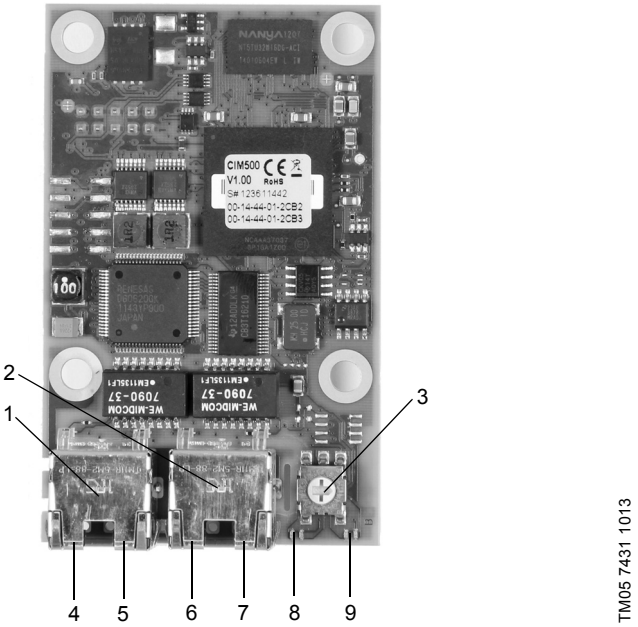

Fig. 11 Example of Ethernet connection (CIM 500)

Pos.	Description	Designation
1	Industrial Ethernet RJ45 Connector 1	ETH1
2	Industrial Ethernet RJ45 Connector 2	ETH2
3	Rotary switch for protocol selection	SW1
4	Data activity LED for Connector 1	DATA1
5	Link LED for Connector 1	LINK1
6	Data activity LED for Connector 2	DATA2
7	Link LED for Connector 2	LINK2
8	Green/red status LED for Ethernet communication	LED 1
9	Green/red status LED for internal communication between module and pump.	LED 2

6.2 Setting the Industrial Ethernet protocol

The CIM 500 Ethernet module has a rotary switch for selection of the Industrial Ethernet protocol. See fig. 12.

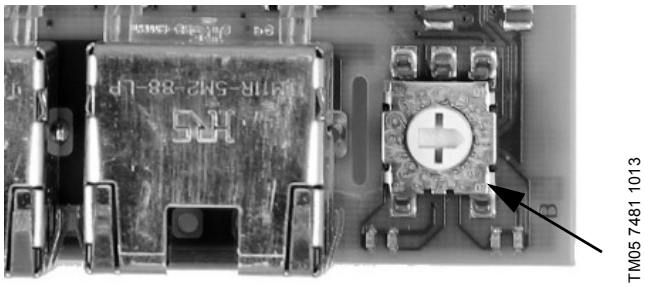

Fig. 12 Selecting the Industrial Ethernet protocol

Pos.	Description
0	PROFINET IO (default)
1	Modbus TCP
2..E	Reserved, LED1 will be permanently red to indicate an invalid configuration
F	Reset to factory default Note: The rotary switch has to be set in this position for 20 seconds before the CIM 500 resets to factory default. During this period LED1 will be flashing red and green at the same time to indicate that a reset will occur.

Note

Every change of the rotary switch, when the module is powered on, will cause the module to restart.

6.3 Setting up the IP-addresses

The CIM 500 Ethernet module is default set up to a fixed IP address. It is possible to change the IP address settings from the built in web server.

Default IP settings used by web server	IP address:192.168.1.100 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1
IP-settings for Modbus TCP	Must be setup by the Web server
Device name and IP settings for PROFINET IO	Static configuration from Web server or configuration from PROFINET IO configuration tool.

6.4 Establish connection to the Webserver

The CIM 500 module can be configured using the built-in Web server. To establish a connection from a PC to CIM 500 the following steps are required:

- Connect the PC and the CIM 500 module using an Ethernet cable
- Configure the PC Ethernet port to the same subnetwork as the CIM 500, e.g. 192.168.1.101, and the subnet mask to 255.255.255.0. See section *A.2 Web server configuration* on page 38.
- Open a standard Internet browser and type 192.168.1.100 in the URL field.
- Log in to the Web server using:

User	admin (default)
Password	Grundfos (default)

Note ***User and password may have been changed from their factory default values.***

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Fig. 13 CIM 500 connected to PC

Note ***Both ETH1 and ETH2 can be used to establish a connection to the Web server.***

Note ***The web server can be accessed while the selected Industrial Ethernet protocol is active.***

6.5 Status LEDs

The CIM 500 Ethernet module has two Status LEDs, (LED1 and LED2). See fig. 11.

- Red/green status LED (LED1) for Ethernet communication
- Red/green status LED (LED2) for internal communication between the CIM 500 and the Grundfos product.

LED1

Status	Description
Off	The CIM 500 is switched off.
Flashing green	Wink function. LED will flash 10 times when activated from master.
Permanently green	The CIM 500 is ready for data transmission (data exchange state).
Flashing red (3 Hz, duty cycle 50 %)	Wrong or missing PROFINET IO configuration. See section *9.2.1 LED status*.
Pulsing red (0.3Hz, duty cycle 10%)	Configured, but connection to master lost. See section *9.2.1 LED status*.
Permanently red	Product not supported. See section *9.2.1 LED status*.
Permanently red and green	Error in firmware download. See section *9.2.1 LED status*.
Flashing red and green	After 20 seconds in this state, the CIM 500 factory settings are restored and the device is restarted.

LED2

Status	Description
Off	The CIM 500 is switched off.
Flashing red	No internal communication between the CIM 500 and the Grundfos product.
Permanently red	The CIM 500 does not support the Grundfos product connected.
Permanently green	Internal communication between the CIM 500 and the Grundfos product is OK.
Permanently red and green	Memory fault.

Note ***During start-up, there is a delay of up to 5 seconds before LED1 and LED2 status is updated.***

6.6 DATA and LINK LEDs

The CIM 500 Ethernet module has two connectivity LEDs related to each RJ45 Connector. See fig. 11.

DATA1 and DATA2

These yellow LEDs indicate data traffic activity.

Status	Description
Yellow off	No data communication on RJ45 Connector.
Yellow flashing	Data communication ongoing on RJ45 Connector.
Steady yellow	Heavy network traffic on RJ45 connector.

LINK1 and LINK2

These green LEDs shows whether the ethernet cable is properly connected.

Status	Description
Green off	No Ethernet Link on RJ45 Connector
Green on	Ethernet Link on RJ45 Connector is OK

7. Detailed description of data modules

7.1 Data types

The Grundfos CIM 150/500 supports the following data types.

All data types, except for data type 10, comply with specification IEC 61158-6 standard data types for use in PROFIBUS/ PROFINET profiles.

Data type	Description
1	Boolean
2	Integer 8
3	Integer 16
4	Integer 32
5	Unsigned 8
6	Unsigned 16
7	Unsigned 32
8	Floating point
9	Visible string
10	Non-standard

7.1.1 Explanation to event trigger

When a PROFIBUS/PROFINET master writes an output module, the write action is triggered by a specific event.

This can work in three ways:

Rising edge

Control bits with a rising-edge event trigger behave like a command that is executed when a bit transition from "0" to "1" occurs. Each of them has a corresponding acknowledge bit in PitStatus (module 43) or PumpControlAck (module 44) which is set when the command is executed and cleared when the control bit is written back to "0".

State

Control bits with a state event trigger behave like a "state" that is forced upon the wastewater system. The CIM 150/500 will attempt to make the wastewater system operate according to the "requested" state.

Value change

Control bits/bytes with a value change event trigger behave like a command that is executed when the bit/byte changes its value. The CIM 150/500 will attempt to make the wastewater system operate according to the "requested" value. The change will be reflected in a bit/byte value in a corresponding input module.

7.1.2 Overview of the data modules

The table below shows how the PROFIBUS/PROFINET data modules are organised in this manual.

Module type	Section	Modules
Control (output modules)	*7.2 Control of wastewater pit*	1
	7.3 Control of wastewater pumps	2-7
	7.4 Setting of real-time clock	8
	7.5 Setting of analog outputs	9-11
	7.6 Level control settings	12-40
	7.7 Setting of pump index	41
Status (input modules)	*7.8 Pit measurement data modules (input modules)*	43-110
	7.9 Pump measurement data modules	111-141
	7.11 Dedicated Controls (CU 36X), alarms and warnings	49-52, 57-59, 117-118
	7.12 $AUTO_{ADAPT}$ system (CIU XX2), alarms and warnings	49-50, 53-54, 57-59, 119-120
	7.13 Device identification (DeviceIdentification, module 142)	142

7.2 Control of wastewater pit

All multi-byte data types are transmitted with MSB (Most Significant Byte) first.

Module	Name	Data type	Unit	Description			CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
								Single pit	Multi-pit
				Output module for the control of the wastewater pit. An acknowledge bit to each command can be found in input module PitStatus (module 43).					
				Bit	**Name and description**	**Event trigger**			
1	Pit Control	5	Bit	0	RemoteAccessReq Used to enable the writing to output modules. 0: Writing to output modules disabled. Control from bus (remote) is not possible. 1: Writing to output modules enabled. Control from bus (remote) is possible.	State	●	●	●
				1	ResetAlarm Used as remote, manual alarm acknowledgement. The command is acknowledged by the ResetAlarmAck bit.	Rising edge	●	●	●
				2	AutoPit Used to release an interlocked pit. The actual operating mode of the pit can be read from PitOperatingMode (module 45). The command is acknowledged by the AutoPitAck bit.	Rising edge	●	-	-
				3	InterlockPit The system will be interlocked and the wastewater system will stop pumping. The command is acknowledged by the InterlockPitAck bit.	Rising edge	●	-	-
1	Pit Control	5	Bit	4	CustomRelayPulse Will generate a toggle pulse at the CU 36X user-defined relay once it has been set to "bus-controlled" (must be set with the Grundfos PC Tool WW Controls). The command is acknowledged by the CustomRelayPulseAck bit.	Rising edge	●	-	-
				5	CustomRelayOnOff Can be used to control the CU 36X user-defined relay once it has been set to "bus-controlled" (must be set with the Grundfos PC Tool WW Controls).	State	●	-	-
				6-7	RESERVED	-	-	-	-

7.3 Control of wastewater pumps

A pump control module is available for each of the possible wastewater pumps.

Module	Name	Data type	Unit	Description
2	Pump1Control	6		Output module for the control of pump 1.
			enum	Byte 1 (data type 5) **SetPump1OperatingMode [Enumeration]** AUTO$_{ADAPT}$**:** The actual operating mode of the pump can be read from PumpOperatingMode (module 112). **Dedicated Controls:** PumpControlSource (module 114) and PumpPumpingMode (module 115) show how the pump operates.

Value	Name	Event trigger	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$ Single pit	CIU XX2 AUTO$_{ADAPT}$ Multi-pit
0	Auto	Value change	●	●	●
1	ForcedStart		●	●	●
2	ForcedStop		●	●	●
3-255	-	-	-	-	-

			bits	Byte 2 (data type 5) **Pump1Commands [bits]** A command for resetting the pump alarms and a command for forcing a pump to pump the water level down to the stop level.

Bit	Name	Event trigger	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$ Single pit	CIU XX2 AUTO$_{ADAPT}$ Multi-pit
0	Pump1ResetAlarm	Rising edge	-	●	●
1	Pump1PumpDown	Rising edge	-	●	●
2-7	-	-	-	-	-

3	Pump2Control	6	enum/ bits	Output module for the control of pump 2. See above.
4	Pump3Control	6	enum/ bits	Output module for the control of pump 3. See above.
5	Pump4Control	6	enum/ bits	Output module for the control of pump 4. See above.
6	Pump5Control	6	enum/ bits	Output module for the control of pump 5. See above. **Note:** Pump 5 is not supported by AUTO$_{ADAPT}$ wastewater systems.
7	Pump6Control	6	enum/ bits	Output module for the control of pump 6. See above. **Note:** Pump 6 is not supported by AUTO$_{ADAPT}$ wastewater systems.

7.4 Setting of real-time clock

Triggered by value change. Can also be set via the CU 36X "Settings" menu.

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO*ADAPT*	
						Single pit	Multi-pit
8	SetRealTimeClock	7	Unix time	Output module used for setting the internal real-time clock (RTC) in Unix Time format (seconds since January 1 1970). **Example** Date: 14-09-2011, 10:30:00. Unix Time: 1316014200 (4E70C878h).	●	-	-

7.5 Setting of analog outputs

Before a bus-controlled analog output can be used, the CU 36X must be configured for this purpose. This can only be done with the Grundfos PC Tool WW Controls.

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO*ADAPT*	
						Single pit	Multi-pit
9	SetAnalogOutput1	6	0.01 %	Output module used for the control of Analog output 1.	●	-	-
10	SetAnalogOutput2	6	0.01 %	Output module used for the control of Analog output 2.	●	-	-
11	SetAnalogOutput3	6	0.01 %	Output module used for the control of Analog output 3.	●	-	-

7.6 Level control settings

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
12	SetOverflowLevel	6	0.01 m	Sets the overflow level. The actual level can be read from OverflowLevel (module 61). Can also be set via the CU 36X.	●	-	-
13	SetHighLevel	6	0.01 m	Sets the high level. The actual level can be read from HighLevel (module 62). Can also be set via the CU 36X.	●	-	-
14	SetAlarmLevel	6	0.01 m	Sets the alarm level. The actual level can be read from AlarmLevel (module 63). Can also be set via the CU 36X.	●	-	-
15	SetDryRunningLevel	6	0.01 m	Sets the dry-running level. The actual level can be read from DryRunningLevel (module 64). Can also be set via the CU 36X.	●	-	-
16	SetFoamDrainLevel	6	0.01 m	Sets the foam-draining level. The actual level can be read from FoamDrainLevel (module 65). Can also be set via the CU 36X.	●	-	-
17	SetSinglePitStopLevel	5	0.01 m	Sets the pit stop level in AUTO$_{ADAPT}$ wastewater systems. The actual level can be read from SinglePitStopLevel (module 66). Can also be set with the R100 or Grundfos GO remote (in service mode). **Note:** The factory-set value should **not** be changed, except in very special cases.	-	●	-
18	SetSinglePitStartLevel	5	0.01 m	Sets the pit start level in AUTO$_{ADAPT}$ wastewater systems. The actual level can be read from SinglePitStartLevel (module 67). Can also be set with the R100 or Grundfos Go remote.	-	●	-
19	SetSinglePitStartBand	5	0.01 m	Sets the pit start band in AUTO$_{ADAPT}$ wastewater systems. The actual band can be read from SinglePitStartBand (module 68). Can also be set with the R100 or Grundfos GO remote (in service mode). **Note:** The factory-set value should **not** be changed, except in very special cases.	-	●	-
20	SetSinglePitHighLevel	5	0.01 m	Sets the high level in AUTO$_{ADAPT}$ wastewater systems. The actual level can be read from SinglePitHighLevel (module 69). Can also be set with the R100 or Grundfos GO remote.	-	●	-
21	SetStartLevelP1	6	0.01 m	Sets the pump start/stop levels in Dedicated Controls systems or AUTO$_{ADAPT}$ wastewater systems operating in multi-pit mode. The actual levels can be read from the corresponding modules 70 to 81. **Dedicated Controls:** These levels can also be set via the CU 36X. **AUTO$_{ADAPT}$:** These levels cannot be set with the R100 or Grundfos GO remote.	●	-	●
22	SetStopLevelP1	6	0.01 m		●	-	●
23	SetStartLevelP2	6	0.01 m		●	-	●
24	SetStopLevelP2	6	0.01 m		●	-	●
25	SetStartLevelP3	6	0.01 m		●	-	●
26	SetStopLevelP3	6	0.01 m		●	-	●
27	SetStartLevelP4	6	0.01 m		●	-	●
28	SetStopLevelP4	6	0.01 m		●	-	●
29	SetStartLevelP5	6	0.01 m		●	-	-
30	SetStopLevelP5	6	0.01 m		●	-	-
31	SetStartLevelP6	6	0.01 m		●	-	-
32	SetStopLevelP6	6	0.01 m		●	-	-
33	SetMultiPitStartBandP1	5	0.01 m	Sets the pump start band and pump high-level alarm limit in AUTO$_{ADAPT}$ wastewater systems operating in multi-pit mode. The actual values can be read from the corresponding modules 82 to 89. These values cannot be set with the R100 or Grundfos GO remote.	-	-	●
34	SetMultiPitHighLevelP1	5	0.01 m		-	-	●
35	SetMultiPitStartBandP2	5	0.01 m		-	-	●
36	SetMultiPitHighLevelP2	5	0.01 m		-	-	●
37	SetMultiPitStartBandP3	5	0.01 m		-	-	●
38	SetMultiPitHighLevelP3	5	0.01 m		-	-	●
39	SetMultiPitStartBandP4	5	0.01 m		-	-	●
40	SetMultiPitHighLevelP4	5	0.01 m		-	-	●

7.7 Setting of pump index

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
41	SetPumpIndex	5	enum	Pump index This output module selects from which pump the measured data (modules 111 to 141) is to be read. Permissible range is [1; highest pump number]. Its actual value can be read from PumpIndex (module 111).	•	•	•

7.8 Pit measurement data modules (input modules)

Module	Name	Data type	Unit	Description		CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
							Single pit	Multi-pit
43	PitStatus	5	bits	Status bits related to output module PitControl (module 1). The bits that are acknowledge bits will be set when the associated control bit is set and the command has been executed. It will be cleared when the control bit is cleared.				
				Bit	**Name and description**			
				0	ActRemoteAccess Indicates whether writing to output modules is enabled. 0: Writing to output modules disabled. Control from bus (remote) is not possible. 1: Writing to output modules enabled. Control from bus (remote) is possible.	•	•	•
				1	ResetAlarmAck Acknowledge bit to ResetAlarm control bit.	•	•	•
				2	AutoPitAck Acknowledge bit to AutoPit control bit.	•	-	-
				3	InterlockPitAck Acknowledge bit to InterlockPit control bit.	•	-	-
				4	CustomRelayPulseAck Acknowledge bit to CustomRelayPulse control bit.	•	-	-
				5	PitMode Pit mode of AUTO$_{ADAPT}$ wastewater system. 0: Single-pit mode 1: Multi-pit mode.	-	•	•
				6-7	RESERVED			-
44	PumpControlAck	6	bits	Acknowledge bits related to commands in the pump control output modules Pump#Control (modules 2 to 7). A bit will be set when the associated control bit is set and the command has been executed. It will be cleared when the control bit is cleared.				
				Byte 1 bit	**Name and description**			
				0	Pump1ResetAlarmAck	-	•	•
				1	Pump1PumpDownAck	-	•	•
				2	Pump2ResetAlarmAck	-	•	•
				3	Pump2PumpDownAck	-	•	•
				4	Pump3ResetAlarmAck	-	•	•
				5	Pump3PumpDownAck	-	•	•
				6	Pump4ResetAlarmAck	-	•	•
				7	Pump4PumpDownAck	-	•	•
				Byte 2 bit	**Name and description**			
				0-7	RESERVED			

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
45	PitOperatingMode	5	enum	Operating mode of pit **Value** **Description** 0 Standby 1 Start-up delay 2 Pumping (level control) 3 Stop delay 4 Pumping max. 5 Stopped (level control) 6 Foam draining 7 Daily emptying 8 Pump anti-seizing 9 Manuel control (all enabled pumps in manual control) 10 Interlock control 11 Mains supply fault 12 Level sensor fault 13 All enabled pumps in alarm 14 All pumps out of operation 15 Service mode, alarms suppressed			
46	FloatSwitchStatus	5	bits	Status of float switches **Bit** **Name and description** 0 FloatSwitch1Status 0: Off 1: On (float switch up). 1 FloatSwitch2Status 0: Off 1: On (float switch up). 2 FloatSwitch3Status 0: Off 1: On (float switch up). 3 FloatSwitch4Status 0: Off 1: On (float switch up). 4 FloatSwitch5Status 0: Off 1: On (float switch up). 5 ExtraOverflowSwitchStatus 0: Off 1: On (float switch up).			
47	IOLogicOutput	5	bits	Eight logic outputs from the I/O logic function (user-defined functions). These outputs are to be set up via the CU 36X.			
48	DigitalInputs	5	bits	Status of digital inputs **Bit** **Name and description** 0 DigitalInput1 0: Not active 1: High-level alarm. 1 DigitalInput2 0: Not active 1: General alarm.			
49	AlarmCode	5	enum	See sections *7.11.4 Dedicated Controls (CU 36X), alarm/warning bits* and *7.12.4 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning bits*.			
50	WarningCode	5	enum				
51	DCPitAlarmBits	10	bits				
52	DCPitWarningBits	10	bits				
53	AAPitAlarmBits	6	bits				
54	AAPitWarningBits	6	bits				

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
55	PitPumpsPresent	5	bits	One bit for each present pump.			
				Bit **Name and description**			
				0 Pump1Present	●	●	●
				1 Pump2Present	●	●	●
				2 Pump3Present	●	●	●
				3 Pump4Present	●	●	●
				4 Pump5Present	●	-	-
				5 Pump6Present	●	-	-
				6 MixerPresent	●	-	-
56	PitPumpsRunning	5	bits	One bit for each running pump.			
				Bit **Name and description**			
				0 Pump1Running	●	●	●
				1 Pump2Running	●	●	●
				2 Pump3Running	●	●	●
				3 Pump4Running	●	●	●
				4 Pump5Running	●	-	-
				5 Pump6Running	●	-	-
				6 MixerRunning	●	-	-
57	PitPumpsCommFault	5	bits	One bit for each pump having a communication fault.			
				Bit **Name and description**			
				0 Pump1CommFault	●	●	●
				1 Pump2CommFault	●	●	●
				2 Pump3CommFault	●	●	●
				3 Pump4CommFault	●	●	●
				4 Pump5CommFault	●	-	-
				5 Pump6CommFault	●	-	-
				6 MixerCommFault			
58	PitPumpsAlarm	5	bits	One bit for each pump having an alarm.			
				Bit **Name and description**			
				0 Pump1Alarm	●	●	●
				1 Pump2Alarm	●	●	●
				2 Pump3Alarm	●	●	●
				3 Pump4Alarm	●	●	●
				4 Pump5Alarm	●	-	-
				5 Pump6Alarm	●	-	-
				6 MixerAlarm	●	-	-
59	PitPumpsWarning	5	bits	One bit for each pump having a warning.			
				Bit **Name and description**			
				0 Pump1Warning	●	-	-
				1 Pump2Warning	●	-	-
				2 Pump3Warning	●	-	-
				3 Pump4Warning	●	-	-
				4 Pump5Warning	●	-	-
				5 Pump6Warning	●	-	-
				6 MixerWarning	●	-	-

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
60	PitPumpsDisabled	5	bits	One bit for each disabled pump. **Bit** **Name and description** 0 Pump1Disabled 1 Pump2Disabled 2 Pump3Disabled 3 Pump4Disabled 4 Pump5Disabled 5 Pump6Disabled 6 MixerDisabled	● ● ● ● ● ● ●	- - - - - - -	- - - - - - -
61	OverflowLevel	6	0.01 m	Actual overflow level. Can be set with SetOverflowLevel (module 12).	●	-	-
62	HighLevel	6	0.01 m	Actual high level. Can be set with SetHighLevel (module 13).	●	-	-
63	AlarmLevel	6	0.01 m	Actual alarm level. Can be set with SetAlarmLevel (module 14).	●	-	-
64	DryRunningLevel	6	0.01 m	Actual dry-running level. Can be set with SetDryRunningLevel (module 15).	●	-	-
65	FoamDrainLevel	6	0.01 m	Actual foam-draining level. Can be set with SetFoamDrainLevel (module 16).	●	-	-
66	SinglePitStopLevel	5	0.01 m	Actual common pump control settings for AUTO$_{ADAPT}$ wastewater systems operating in single-pit mode. Can be set with the corresponding output modules 17 to 20.	-	●	-
67	SinglePitStartLevel	5	0.01 m		-	●	-
68	SinglePitStartBand	5	0.01 m		-	●	-
69	SinglePitHighLevel	5	0.01 m		-	●	-
70	StartLevelP1	6	0.01 m	Actual pump start/stop levels in Dedicated Controls systems or AUTO$_{ADAPT}$ wastewater systems operating in multi-pit mode. Can be set with the corresponding output modules 21 to 32.	●	-	●
71	StopLevelP1	6	0.01 m		●	-	●
72	StartLevelP2	6	0.01 m		●	-	●
73	StopLevelP2	6	0.01 m		●	-	●
74	StartLevelP3	6	0.01 m		●	-	●
75	StopLevelP3	6	0.01 m		●	-	●
76	StartLevelP4	6	0.01 m		●	-	●
77	StopLevelP4	6	0.01 m		●	-	●
78	StartLevelP5	6	0.01 m		●	-	-
79	StopLevelP5	6	0.01 m		●	-	-
80	StartLevelP6	6	0.01 m		●	-	-
81	StopLevelP6	6	0.01 m		●	-	-
82	MultiPitStartBandP1	5	0.01 m	Actual pump start band and pump high-level alarm limit in AUTO$_{ADAPT}$ wastewater systems operating in multi-pit mode. The actual values can be set with the corresponding output modules 33 to 40.	-	-	●
83	MultiPitHighLevelP1	5	0.01 m		-	-	●
84	MultiPitStartBandP2	5	0.01 m		-	-	●
85	MultiPitHighLevelP2	5	0.01 m		-	-	●
86	MultiPitStartBandP3	5	0.01 m		-	-	●
87	MultiPitHighLevelP3	5	0.01 m		-	-	●
88	MultiPitStartBandP4	5	0.01 m		-	-	●
89	MultiPitHighLevelP4	5	0.01 m		-	-	●
90	PitWaterLevel	6	0.01 m	Sensor-measured water level in the pit. Requires a level sensor for Dedicated Controls.	●	●	-
91	PitSwitchWaterLevel	6	enum	Float-switch-detected water level in the pit. Requires one or more float switches. Range: 0 to 5.	●	-	-
92	PitDepth	6	0.01 m	Depth of the pit.	●	-	-
93	ActualFlowIn	6	0.1 l/s	Actual water flow into the pit.	●	-	-
94	AverageFlowIn	6	0.1 l/s	Average water flow into the pit.	●	-	-
95	ActualFlowOut	6	0.1 l/s	Actual water flow out of the pit.	●	-	-
96	AverageFlowOut	6	0.1 l/s	Average water flow out of the pit.	●	-	-
97	SpecificEnergy	6	Wh/m^3	Specific energy consumption.	●	-	-
98	OverflowVolume	6	0.1 m^3	Overflow volume.	●	-	-
99	OverflowTime	6	1 min.	Time with overflow condition.	●	-	-
100	OverflowCounter	6	-	Counter of overflow occurrences.	●	-	-

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
101	Power	7	1 W	Total power consumption of wastewater pit.	●	●	●*
102	Energy	7	0.1 kWh	Total energy consumption of wastewater pit.	●	●	●*
103	RunTime	7	1 min.	Running time (at least one pump has been running).	●	●	●*
104	Volume	7	0.1 m^3	Totally pumped volume of wastewater pit.	●	-	-
105	AnalogInput1	6	0.10 %	Value of analog input 1 measurement.	●	-	-
106	AnalogInput2	6	0.10 %	Value of analog input 2 measurement.	●	-	-
107	AnalogInput3	6	0.10 %	Value of analog input 3 measurement.	●	-	-
108	MixerStartsPerHour	6	/h	Number of mixer starts per hour.	●	-	-
109	MixerRuntime	7	1 min.	Total running time of mixer.	●	-	-
110	MixerStartCounter	7	-	Total number of mixer starts.	●	-	-

* For AUTO$_{ADAPT}$ wastewater systems operating in multi-pit mode, this value is the sum of the values from all pits.

7.9 Pump measurement data modules

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
111	PumpIndex	5	enum	Actual pump index. Selects from which pump the measured data (modules 111 to 141) is to be read. Can be set via SetPumpIndex (module 41).	●	●	●
112	PumpOperatingMode	5	enum	Operating mode of AUTO$_{ADAPT}$ pump. 0: Auto (power-on default) 1: Forced start 2: Forced stop.	-	●	●
113	PumpConnectionType	5	enum	Pump connection type. 0: CU 36X relay 1: IO 351 relay 2: CU 36X + frequency converter (VFD) 3: IO 351 + frequency converter (VFD).	●	-	-
114	PumpControlSource	5	enum	Pump control source. 0: Auto, level control 1: Switch 2: Display 3: Remote-controlled/fieldbus.	●	-	-
115	PumpPumpingMode	5	enum	Pumping mode of pump. 0: Running 1: Stopped 2: Disabled 3: Not present.	●	-	-
116	PumpAuxDevices	10	-	Presence and status of auxiliary electronic devices. **Byte 1:** IO 111 status [enum] 0: Not present 1: Present and working OK 2: Present, but faulty 3: Present, but no communication. **Byte 2:** MP 204 status [enum] 0: Not present 1: Present and working OK 2: Present, but faulty 3: Present, but no communication. **Byte 3:** CUEDrive status [enum] 0: Not present 1: Present and working OK 2: Present, but faulty 3: Present, but no communication.	●	-	-

Module	Name	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO$_{ADAPT}$	
						Single pit	Multi-pit
117	DCPumpAlarmBits	10	bits	See section *7.6 Level control settings*.	●	-	-
118	DCPumpWarningBits	10	bits		●	-	-
119	AAPumpAlarmBits	6	bits		-	●	●
120	AAPumpWarningBits	6	bits		-	●	●
121	PumpLatestRunTime	6	1 s	For how long did the pump run last time.	●	-	-
122	PumpStartsPerHour	6	/h	Number of pump starts per hour.	●	-	-
123	PumpFlow	6	0.1 l/s	Current pump flow.	●	-	-
124	PumpLatestFlow	6	0.1 l/s	Measured flow the last time the pump was running.	●	-	-
125	PumpCurrent	6	0.1 A	Pump current consumption.	●	●	●
126	PumpLatestCurrent	6	0.1 A	Pump current consumption last time the pump was running.	●	●	●
127	PumpInsulation	6	10 kW	Motor winding insulation.	●	-	-
128	PumpWaterInOil	6	0.01 %	Water in motor oil.	●	-	-
129	PumpMotorTemp1	6	1 °C	Motor winding temperature 1.	●	●	●
130	PumpMotorTemp2	6	1 °C	Motor winding temperature 2.	●	●	●
131	PumpCosPhi	6	0.01	Pump cos(φ), power factor.	●	●	●
132	PumpFrequency	6	0.01 Hz	Pump frequency.	●	●	●
133	PumpVoltage	6	0.1 V	Pump voltage.	●	●	●
134	PumpVFDMode	5	enum	Mode of pump frequency converter (VFD). 0: VFD not controlled 1: - 2: Stopped 3: Reverse start 4: Start flushing 5: Normal 6: Run flushing.	●	-	-
135	PumpCurrentAsym	5	0.10 %	Pump current asymmetry.	●	-	-
136	PumpRunTime	7	1 min.	Pump running time.	●	●	●
137	PumpTimeToService	7	1 min.	Time to next pump service.	●	-	-
138	PumpNumberOfStarts	7	-	Number of pump starts.	●	●	●
139	PumpPower	7	1 W	Pump power consumption.	●	●	●
140	PumpEnergy	7	0.1 kWh	Pump energy consumption.	●	●	●
141	PumpLevel	6	0.01 m	Level in pit as measured by integrated pump sensor.	-	●	●

7.10 User-defined counters

The three user-defined counters uses digital inputs on the IO 351 module to show *events*. These events are defined by the user and the programming is done on the CU 36X controller display. Which scaling (text) to associate with the event is also programmed on the CU 36X. The value of the counters can be transferred via PROFIBUS/PROFINET input modules 145, 146 and 147 and the values can be individually reset with the PROFIBUS/PROFINET output module 144.

Module	Name	In/Out	Data type	Unit	Description	CU 36X Dedicated Controls	CIU XX2 AUTO*ADAPT*	
							Single pit	Multi-pit
144	ResetUserDefCounters	Output	5	bits	Bit / Name / Event trigger 0 / ResetUserDefCounter1 / Rising edge 1 / ResetUserDefCounter2 / Rising edge 2 / ResetUserDefCounter3 / Rising edge 3-7 / -	●	-	-
145	UserDefCounter1	Input	6	-	Value of user-defined counter 1, setup from CU 36X	●	-	-
146	UserDefCounter2	Input	6	-	Value of user-defined counter 2, setup from CU 36X	●	-	-
147	UserDefCounter3	Input	6	-	Value of user-defined counter 3, setup from CU 36X	●	-	-

7.11 Dedicated Controls (CU 36X), alarms and warnings

7.11.1 Dedicated Controls (CU 36X), general alarm/warning behaviour

All alarms and warnings can be of acknowledge type "Auto" or "Manual".

If the acknowledge type is "Auto", for the event in question, the CU 36X does not use any restart delay for the pumps. Except for the delay that might be present in the auxiliary devices (for the MP 204 this is programmable), a pump will restart immediately when the alarm condition that caused its stop disappears. The belonging alarm/warning modules and the LED indication will also be automatically reset. The alarm/warning relay has its own Auto/Manuel acknowledge setting.

If the acknowledge type is "Manual", for the event in question, the CU 36X will remain in alarm/warning state when the alarm/warning condition disappears. No pump will be auto-restarted. The belonging alarm/warning indication in data modules will remain and so will the LED indication. The alarm/warning relay has its own Auto/Manuel acknowledge setting. A ResetAlarm command or an alarm acknowledgement via the CU 36X display is necessary to clear the alarm/warning indication. This will also deactivate the alarm/warning relay if it was set to manual acknowledgement.

7.11.2 Dedicated Controls (CU 36X), alarm/warning modules

Module	Name	Data type	Unit	Description
49	AlarmCode	5	enum	Code for active alarm in the Dedicated Controls system (prioritised). One bit for each alarm. See code description in section *7.11.3 Dedicated Controls (CU 36X), alarm/warning*.
50	WarningCode	5	enum	Code for active warning in the Dedicated Controls system (prioritised). One bit for each warning. See code description in section *7.11.3 Dedicated Controls (CU 36X), alarm/warning*.
51	DCPitAlarmBits	10	bits	All active system alarms in the Dedicated Controls system. One bit for each alarm. See bit description in section *7.11.4 Dedicated Controls (CU 36X), alarm/warning bits*.
52	DCPitWarningBits	10	bits	All active system warnings in the Dedicated Controls system. One bit for each warning. See bit description in section *7.11.4 Dedicated Controls (CU 36X), alarm/warning bits*.
57	PitPumpsCommFault	5	bits	Bits 0-5: Communication fault status for pumps 1 to 6. One bit for each pump.
58	PitPumpsAlarm	5	bits	Bits 0-5: Alarm status for pumps 1 to 6. One bit for each pump.
59	PitPumpsWarning	5	bits	Bits 0-5: Warning status for pumps 1 to 6. One bit for each pump.
117	DCPumpAlarmBits	10	bits	All active pump alarms in the Dedicated Controls system. One bit for each alarm. The pump in question is selected by PumpIndex (module 111). See bit description in section *7.11.4 Dedicated Controls (CU 36X), alarm/warning bits*.
118	DCPumpWarningBits	10	bits	All active pump warnings in the Dedicated Controls system. One bit for each warning. The pump in question is selected by PumpIndex (module 111). See bit description in section *7.11.4 Dedicated Controls (CU 36X), alarm/warning bits*.

7.11.3 Dedicated Controls (CU 36X), alarm/warning

The codes below are used for data module 49, AlarmCode, and 50, WarningCode.

Code	Description of alarm/warning	Source of the alarm/warning
3	External fault signal	System
6	Mains fault	System
15	Communication fault, main system (SCADA)	System
57	Dry running	System
72	Hardware fault (general)	CU 36X/IO 351
159	CIM fault (Communication Interface Module)	Add-on CIM
160	SIM card fault	Add-on CIM
168	Signal fault, pressure sensor, discharge line	AI (pressure sensor)
169	Signal fault, flow sensor	AI (flow sensor)
186	Signal fault, power meter sensor	AI (power sensor)
188	Signal fault, user-defined sensor 1	AI (user-defined sensor 1)
188	Signal fault, user-defined sensor 2	AI (user-defined sensor 2)
188	Signal fault, user-defined sensor 3	AI (user-defined sensor 3)
189	Signal fault, level sensor	AI (level sensor)
190	Alarm-level alarm	System
191	High-level alarm	System
192	Overflow level alarm	System
204	Inconsistency between float switches and sensors	System
205	Level float switch sequence inconsistency	System
221	Fault, mixer contactor feedback	DI (mixer contactor)
222	Time for service, mixer	Mixer
223	Maximum number of mixer starts per hour exceeded	System
226	Communication fault, I/O module	IO 351
227	Combi event 1	System
227	Combi event 2	System
227	Combi event 3	System
227	Combi event 4	System
229	Water on floor	DI
231	Ethernet: No IP address from DHCP server	System
232	Ethernet: Auto-disabled due to misuse	System
235	Gas detected	DI
246	User-defined relay has been forced (manually operated/ commanded)	CU 36X
247	Power-on notice (device/system has been switched off)	System
248	Fault, battery/UPS	Battery/UPS
249	User-defined event 1	User-defined
250	User-defined event 2	User-defined
251	User-defined event 3	User-defined
252	User-defined event 4	User-defined

7.11.4 Dedicated Controls (CU 36X), alarm/warning bits

Module	Name	Data type	Unit	Description
51	DCPitAlarmBits	10	bits	All active system alarms in the Dedicated Controls system.

Byte 1 bit	Description	Code	Source
0	Overflow level alarm	192	System
1	High-level alarm	191	System
2	Alarm-level alarm	190	System
3	Dry running	57	System
4	Mains fault	6	System
5	Level float switch sequence inconsistency	205	System
6	Inconsistency between float switches and sensors	204	System
7	Signal fault, level sensor	189	AI (level sensor)

Byte 2 bit	Description	Code	Source
0	Signal fault, flow sensor	169	AI (flow sensor)
1	Signal fault, power meter sensor	186	AI (power sensor)
2	Fault, mixer contactor feedback	221	DI (mixer contactor)
3	Communication fault, I/O module	226	IO 351
4	CIM fault (Communication Interface Module)	159	Add-on CIM
5	SIM card fault	160	Add-on CIM
6	Communication fault, main system (SCADA)	15	System
7	Power-on notice	247	System

Byte 3 bit	Description	Code	Source
0	Fault, battery/UPS fault	248	Battery/UPS
1	Hardware fault (general)	72	CU 36X/IO 351
2	Ethernet: No IP address from DHCP server	231	System
3	Ethernet: Auto-disabled due to misuse	232	System
4	Time for service, mixer	222	Mixer
5	Maximum number of mixer starts per hour exceeded	223	System
6	User-defined relay has been forced	246	CU 36X
7	RESERVED	-	-

Byte 4 bit	Description	Code	Source
0	External fault signal	3	System
1	Combi event 1	227	System
2	Combi event 2	227	System
3	Combi event 3	227	System
4	Combi event 4	227	System
5	Signal fault, user-defined sensor 1	188	AI (user-defined sensor 1)
6	Signal fault, user-defined sensor 2	188	AI (user-defined sensor 2)
7	Signal fault, user-defined sensor 3	188	AI (user-defined sensor 3)

Byte 5 bit	Description	Code	Source
0	Signal fault, pressure sensor, discharge line	168	AI (pressure sensor)
1	Water on floor	229	DI
2	Gas detected	235	DI
3	User-defined event 1	249	User-defined
4	User-defined event 2	250	User-defined
5	User-defined event 3	251	User-defined
6	User-defined event 4	252	User-defined

Module	Name	Data type	Unit	Description			
				7	RESERVED	-	-
51	DCPitAlarmBits	10	bits	**Byte 6 bit**	**Description**	**Code**	**Source**
				0-7	RESERVED	-	-
52	DCPitWarningBits	10	bits	All active system warnings in the Dedicated Controls system. Bit description is identical to DCPitAlarmBits (module 51).			
117	DCPumpAlarmBits	10	bits	All active pump alarms in the Dedicated Controls system. The pump in question is selected by PumpIndex (module 111).			
				Byte 1 bit	**Description**	**Code**	**Source**
				0	Thermal relay 1 in motor (e.g. Klixon)	69	IO 111
				1	Thermal relay 2 in motor (e.g. thermistor)	70	IO 351/MP 204/CUE
				2	Motor stator temperature high (T1, Pt1000/ Pt100)	64	IO 111/CUE
				3	Motor stator temperature high (T2, Pt1000/ Pt100)	71	MP 204
				4	Motor support bearing temperature high (Pt100)	145	IO 111
				5	Motor main bearing temperature high (Pt100)	146	IO 111
				6	Motor insulation resistance low	20	IO 111/MP 204
				7	Undervoltage	40	MP 204/CUE
				Byte 2 bit	**Description**	**Code**	**Source**
				0	Overvoltage	32	MP 204/CUE
				1	Phase sequence reversal	9	MP 204
				2	Overload	48	AI/MP 204/CUE
				3	Underload	56	AI/MP 204
				4	External motor protector activated	27	DI
				5	Missing phase	2	MP 204/CUE
				6	Current asymmetry	111	MP 204
				7	Load continues even if the motor has been switched off	26	MP 204
				Byte 3 bit	**Description**	**Code**	**Source**
				0	Motor protector commanded (test) trip	18	MP 204
				1	Motor phase failure	241	DI/CUE
				2	Moisture switch alarm, digital	22	IO 111
				3	Motor/pump vibration high	24	IO 111
				4	Water-in-oil fault (motor oil)	11	AI/IO 111
				5	Mains fault	6	DI
				6	Fault, motor contactor feedback	220	DI
				7	Too many motor starts per hour	21	System
				Byte 4 bit	**Description**	**Code**	**Source**
				0	Time for service (general service information)	12	System
				1	Too many pump auto-restarts (per 24 h)	4	MP 204
				2	Low pump flow	58	System
				3	Pump continuous runtime too long	245	System
				4	Cos(φ) too high	112	MP 204
				5	Cos(φ) too low	113	MP 204
				6-7	RESERVED	-	-
				Byte 5 bit	**Description**	**Code**	**Source**
				0	Pump fault (due to auxiliary component or general fault)	224	System
				1	Communication fault, pump module	225	IO 111
				2	Motor relay has been forced (manually operated/ commanded)	243	DI

Module	Name	Data type	Unit	Description			
				3	Signal fault, Pt100 sensor	175	IO 111/MP 204/CUE
				4	Signal fault, PTC sensor (short-circuited)	181	IO 111
				5	Signal fault, water-in-oil (WIO) sensor	170	AI
				6	Signal fault, motor support bearing temperature sensor	179	IO 111
117	DCPumpAlarmBits	10	bits	7	Signal fault, motor main bearing temperature sensor	180	IO 111
				Byte 6 bit	**Description**	**Code**	**Source**
				0	Communication fault, pump	10	IO 111, pump no [1; 6]
				1	Setup conflict	25	IO 111, pump no [1; 6]
				2	Hardware fault (general)	72	IO 111/MP 204, pump no [1; 6]
				3	Sensor fault, motor current	88	AI, pump no [1; 6]
				4	Inrush fault	155	CUE
				5	Signal fault, sensor 2	93	CUE
				6	Motor bearing temperature high (Pt100) in drive end (DE)	148	CUE
				7	Motor bearing temperature high (Pt100) in non-drive end (NDE)	149	CUE
				Byte 7 bit	**Description**	**Code**	**Source**
				0	Leakage current	1	CUE
				1	Signal fault, temperature 3 sensor (t_mo3)	176	CUE
				2	Signal fault, (feedback) sensor 1	89	CUE
				3	Overcurrent (i_line, i_dc, i_mo)	49	CUE
				4	Motor current protection activated (MCP)	55	CUE
				5	Change bearings (specific service information)	30	CUE
				6	Lubricate bearings (specific service information)	240	CUE
				7	Automatic motor model recognition failed	242	CUE
				Byte 8 bit	**Description**	**Code**	**Source**
				0	Communication fault, twin-head pump	77	CUE
				1	Signal fault, temperature 1 sensor	91	CUE
				2	Dry running	57	CUE
				3	VFD not ready	213	IO 351
				4	Other	16	CUE
				5	Blocked motor/pump	51	System
117	DCPumpAlarmBits	10	bits	6	Signal fault, power meter sensor	186	AI
				7	RESERVED	-	-
118	DCPumpWarningBits	10	bits	All active pump warnings in the Dedicated Controls system. The pump in question is selected by PumpIndex (module 111). Bit description is identical to DCPumpAlarmBits (module 117).			

7.12 AUTO$_{ADAPT}$ system (CIU XX2), alarms and warnings

7.12.1 AUTO$_{ADAPT}$ systems (CIU XX2), general alarm/warning behaviour

A pump will automatically restart after an alarm when the alarm condition disappears. Overcurrent cannot be detected before the pump attempts to restart. To prevent rapid and continuous switching out and in of a pump due to an overcurrent alarm appearing and disappearing, the pump uses an overcurrent alarm restart delay with a fixed factory value of 5 minutes.

All other alarm conditions can be detected while the pump is stopped. A value hysteresis for the measured voltage and temperature values eliminates continuous switching in and out in these situations.

7.12.2 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning modules

Module	Name	Data type	Unit	Description
49	AlarmCode	5	enum	Code for active alarm in the AUTO$_{ADAPT}$ wastewater system (prioritised). One bit for each alarm. See code description in section *7.12.3 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning codes*.
50	WarningCode	5	enum	Code for active warning in the AUTO$_{ADAPT}$ wastewater system (prioritised). One bit for each warning. See code description in section *7.12.3 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning codes*.
53	AAPitAlarmBits	6	bits	All active system alarms in the AUTO$_{ADAPT}$ wastewater system. One bit for each alarm.
54	AAPitWarningBits	6	bits	All active system warnings in the AUTO$_{ADAPT}$ wastewater system. One bit for each warning.
57	PitPumpsCommFault	5	bits	Bits 0-3: Communication fault status for pumps 1 to 4. One bit for each pump.
58	PitPumpsAlarm	5	bits	Bits 0-3: Alarm status for pumps 1 to 4. One bit for each pump.
59	PitPumpsWarning	5	bits	Bits 0-3: Warning status for pumps 1 to 4. One bit for each pump.
119	AAPumpAlarmBits	6	bits	All active pump alarms in the AUTO$_{ADAPT}$ wastewater system. One bit for each alarm. The pump in question is selected by PumpIndex (module 111).
120	AAPumpWarningBits	6	bits	All active pump warnings in the AUTO$_{ADAPT}$ wastewater system. One bit for each warning. The pump in question is selected by PumpIndex (module 111).

7.12.3 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning codes

The codes below are used for data modules 49, AlarmCode, and 50, WarningCode.

Code	Description of alarm/warning	Source of the alarm/warning
3	External fault signal	Digital input, DI1
10	Communication fault, pump	CIU XX2
25	Setup conflict, parameter inconsistency	CIU XX2
82	Verification error, code area (ROM, FLASH)	CIU XX2
83	Verification error, FE parameter area (EEPROM)	CIU XX2
191	Limit exceeded, sensor 2 (high level)	Digital input, DI0
230	Network alarm	CIU XX2
236	Pump 1 fault	Pump 1
237	Pump 2 fault	Pump 2
238	Pump 3 fault	Pump 3
239	Pump 4 fault	Pump 4

7.12.4 AUTO$_{ADAPT}$ systems (CIU XX2), alarm/warning bits

Module	Name	Data type	Unit	Description			
53	AAPitAlarmBits	6	bits	All active system alarms in the AUTO$_{ADAPT}$ wastewater system. The pump in question is selected by PumpIndex (module 111).			
				Byte 1 bit	**Description**	**Code**	**Source**
				0	External fault signal	3	Digital input, DI1
				1	Communication fault, pump	10	CIU XX2
				2	Verification error, code area (ROM, FLASH)	82	CIU XX2
				3	Pump 1 fault	236	Pump 1
				4	Pump 2 fault	237	Pump 2
				5	Pump 3 fault	238	Pump 3
				6	Pump 4 fault	239	Pump 4
				7	High-level alarm	191	Digital input, DI0
				Byte 2 bit	**Description**	**Code**	**Source**
				0	Setup conflict	25	CIU XX2
				1	Network alarm	230	CIU XX2
				2	Verification error, FE parameter area (EEPROM)	83	CIU XX2
				3-7	RESERVED	-	-
54	AAPitWarningBits	6	bits	All active system warnings in the AUTO$_{ADAPT}$ wastewater system. Same bit interpretation as AAPitAlarmBits (module 53).			
119	AAPumpAlarmBits	6	bits	All active pump alarms in the AUTO$_{ADAPT}$ wastewater system. The pump in question is selected by PumpIndex (module 111).			
				Byte 1 bit	**Description**	**Code**	**Source**
				0	Phase sequence reversal	9	Pump
				1	Motor high voltage	32	Pump
				2	Motor low voltage	40	Pump
				3	Motor overload, maximum current exceeded	48	Pump
				4	Blocked motor/pump	51	Pump
				5	Dry running	57	Digital sensor
				6	Motor temperature high	65	Pump
				7	High temperature, control electronics	66	Pump
				Byte 2 bit	**Description**	**Code**	**Source**
				0	Thermal relay 1 in motor (e.g. Klixon)	69	Pump
				1	Thermal relay 2 in motor (e.g. thermistor)	70	Pump
				2	Verification error, code area (ROM, FLASH)	82	Pump
				3	Verification error, FE parameter area (EEPROM)	83	Pump
				4	Sensor fault	88	Analog sensor
				5	High-water level exceeded	191	Analog sensor
				6-7	RESERVED	-	-
120	AAPumpWarningBits	6	bits	All active pump warnings in the AUTO$_{ADAPT}$ wastewater system. The pump in question is selected by PumpIndex (module 111). Bit description is identical to AAPumpAlarmBits (module 119).			

7.13 Device identification (DeviceIdentification, module 142)

The data type is 10, non-standard.

Byte	Name/description	
1	**UnitFamily [enumeration]**	**UnitType [enumeration]**
	1: UPE/MAGNA circulator pump	5: UPE, 3-phase 7: MAGNA, 1-phase 9: MAGNA, 1-phase, small 10: MAGNA 3
	2: E-pump, 1-phase/3-phase, based on MGE motor or CUE frequency converter	2: MGE, 1-phase 3: MGE, 3-phase 4: MGE, 3-phase, large 5: CUE frequency converter 6: MGE, 3-phase, model G 7: MGE, 3-phase, model H/I
	7: MP 204 motor protector	1: MP 204
	17: Hydro Multi-E model G and earlier models	1: With 3-phase pumps 2: With 1-phase pumps
	21: Hydro MPC/Control MPC, Hydro Multi-B	1: Hydro MPC/Control MPC, CU 351 2: Hydro Multi-B, CU 323
	25: CR Monitor	1: CR Monitor, CU 351
	26: Dedicated Controls	1: Dedicated Controls, CU 36X
	30: Smart Digital Dosing, DDA	1: Smart Digital Dosing, DDA
	39: Hydro Multi-E model H and later models	1: With 3-phase pumps 2: With 1-phase pumps
2	UnitType [enumeration] According to description above.	
3	UnitVersion [enumeration] Used by Grundfos.	
4	CIMSoftwareVersion [number]	
5	CIMSoftwareRevision [number]	
6	CIMModel [enumeration]	

8. Product simulation

The CIM module can be put in product simulation mode in which case it will generate life-like simulated values of all the PROFIBUS/PROFINET input data modules.

It will thus be possible to connect a PROFIBUS/PROFINET master to a CIU 152 / CIU 502 without this device being connected to a real pump in a real-life system. In an office environment, it can then be verified that communication works and data is being received and handled correctly by the PROFIBUS/PROFINET master application program (e.g. PLC program) before the equipment is installed under real-life conditions.

8.1 CIM 150 product simulation

Product simulation mode is entered when the hexadecimal address switch has one of the values shown in the table below:

Address setting (section *5.4*)		**Simulated product**
SW3	SW4	
F	0	Pump profile
F	1	Booster system profile
F	2	CR Monitor profile
F	3	MP 204 motor protector profile
F	4	Digital Dosing DDA profile
F	5	Wastewater system profile

The effective address will be 15 (0x0F).

Only input modules are simulated. The data read has dummy values and no real product functionality is simulated.

8.2 CIM 500 product simulation

Product simulation mode is entered via the web server.
See section *A.4 PROFINET IO configuration* on page 39.

9. Fault finding

9.1 Fault finding CIM/CIU 150

Faults in a CIM 150 PROFIBUS module can be detected by observing the status of the two communication LEDs. See the table below.

9.1.1 LED status

CIM 150 fitted in a Grundfos CU 35X

Fault (LED status)	Possible cause	Remedy
1. Both LEDs (LED1 and LED2) remain off when the power supply is connected.	a) The CIM 150 is fitted incorrectly in the CU 35X.	Check that the CIM 150 is fitted / connected correctly.
	b) The CIM 150 is defective.	Replace the CIM 150.
2. The LED for internal communication (LED2) is flashing red.	a) No internal communication between the CIM 150 and the CU 35X.	Check that the CIM 150 is fitted correctly in the CU 35X.
3. The LED for internal communication (LED2) is constantly red.	a) The CIM 150 does not support the connected Grundfos product.	Contact the nearest Grundfos company.
4. The PROFIBUS LED (LED1) is constantly red.	a) Fault in the CIM 150.	Contact the nearest Grundfos company.
	b) Connected product is not supported	Contact the nearest Grundfos company.
5. The PROFIBUS LED (LED1) is flashing red.	a) Fault in the CIM 150 PROFIBUS configuration.	• Check that the PROFIBUS address (switches SW3 and SW4) has a valid value [1-126]. See section *5.4 Setting the PROFIBUS address*. • Check that the GSD file used is correct. • Check that the PROFIBUS cable has been fitted correctly. See section *5.3 Connecting the PROFIBUS*. • Check that the PROFIBUS termination is correct. See section *5.5 Termination resistors*.
	b) No contact to PROFIBUS master.	• Check cable connections. • Check that PROFIBUS master is running.

CIM 150 fitted in the CIU 152

Fault (LED status)	Possible cause	Remedy
1. Both LEDs (LED1 and LED2) remain off when the power supply is connected.	a) The CIU 150 is defective.	Replace the CIU 150.
2. The LED for internal communication (LED2) is flashing red.	a) No internal communication between the CIU 150 and the CIU 152.	Check that the CIM 150 is fitted correctly in the CIU 152.
3. The LED for internal communication (LED2) is constantly red.	a) The CIM 150 does not support the connected Grundfos product.	Contact the nearest Grundfos company.
4. The PROFIBUS LED (LED1) is constantly red.	a) Fault in the CIM 150.	Contact the nearest Grundfos company.
	b) Connected product is not supported	Contact the nearest Grundfos company.
5. The PROFIBUS LED (LED1) is flashing red.	a) Fault in the CIM 150 PROFIBUS configuration.	• Check that the PROFIBUS address (switches SW3 and SW4) has a valid value [1-126]. See section *5.4 Setting the PROFIBUS address*. • Check that the GSD file used is correct. • Check that the PROFIBUS cable has been fitted correctly. • Check that the PROFIBUS termination is correct. See section *5.5 Termination resistors*.

9.2 Fault finding CIM/CIU 500

Faults in the CIU 500 can be detected by observing the status of the two communication LEDs. See the table below and section *4.3 CIM 500 PROFINET IO*.

9.2.1 LED status

CIM 500 fitted in a Grundfos CU 35X

Fault (LED status)	Possible cause	Remedy
1. Both LEDs (LED1 and LED2) remain off when the power supply is connected.	a) The CIM 500 is fitted incorrectly in the Grundfos product.	Check that the CIM 500 is fitted/connected correctly.
	b) The CIM 500 is defective.	Replace the CIM 500.
2. The PROFINET IO LED (LED1) remains off.	a) The protocol selection switch (SW1) has been set in Modbus TCP position	Set the switch to "0".
3. The LED for internal communication (LED2) is flashing red.	a) No internal communication between the CIM 500 and the Grundfos product.	Check that the CIM 500 is fitted correctly in the Grundfos product.
4. The LED for internal communication (LED2) is permanently red.	a) The CIM 500 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
5. The PROFINET IO LED (LED1) is permanently red.	a) Connected Grundfos product is not supported.	Contact the nearest Grundfos company.
	b) Illegal position of protocol switch. (SW1)	Check that the rotary switch SW1 is set to "0".
6. The PROFINET IO LED (LED1) is flashing red.	a) Fault in the CIM 500 PROFINET IO configuration.	• Check that the right GSDML file is used. Check that PROFINET IO IP address configuration is correct. See section *PROFINET IO configuration* on page *17*. • Check device name in the CIM 500 and PROFINET IO master.
7. The PROFINET IO LED (LED1) is pulsing red.	a) Connection to master lost.	• Check cables. • Check master is running.
8. LED1 is permanently red and green at the same time.	a) Error in firmware download.	Use the web server to download the firmware again.
9. LED2 is permanently red and green at the same time.	a) Memory fault.	Replace the CIM 500.

CIM 500 fitted in a CIU 502

Fault (LED status)	Possible cause	Remedy
1. Both LEDs (LED1 and LED2) remain off when the power supply is connected	a) The CIU 502 is defective.	Replace the CIU 502.
2. The PROFINET IO LED (LED1) remains off.	a) The protocol selection switch (SW1) has been set in Modbus TCP position	Set the switch in position "0".
3. The LED for internal communication (LED2) is flashing red.	a) No internal communication between the CIM 500 and the CIU 502.	Check that the CIM 150 is fitted correctly in the CIU 502.
4. The LED for internal communication (LED2) is permanently red.	a) The CIM 500 does not support the Grundfos product connected.	Contact the nearest Grundfos company.
5. The PROFINET IO LED (LED1) is permanently red.	a) Connected Grundfos product is not supported.	Contact the nearest Grundfos company.
	b) Illegal position of protocol switch. (SW1)	Check that the rotary switch SW1 is set to "0".
6. The PROFINET IO LED (LED1) is flashing red.	a) Fault in the CIM 500 PROFINET IO configuration.	• Check that the right GSDML file is used. • Check that PROFINET IO IP address configuration is correct. See section *6. PROFINET IO, CIM 500 setup*. • Check device name in CIM 500 and PROFINET IO master.
7. The PROFINET IO LED (LED1) is pulsing red.	a) Connection to master lost.	• Check cables. • Check master is running.
8. LED1 is permanently red and green at the same time	a) Error in firmware download.	Use the web server to download the firmware again.
9. LED2 is permanently red and green at the same time	a) Memory fault.	Replace the CIM 500.

10. Grundfos alarm and warning codes

This is a complete list of alarm and warning codes for Grundfos products. For the codes supported by wastewater systems, see sections *7.11 Dedicated Controls (CU 36X), alarms and warnings* and *7.12 AUTO$_{ADAPT}$ system (CIU XX2), alarms and warnings*.

Code	Description	Code	Description	Code	Description
1	Leakage current	32	Overvoltage	72	Hardware fault, type 1
2	Missing phase	33	Soon time for service (general service information)	73	Hardware shutdown (HSD)
3	External fault signal	35	Gas in pump head, deaerating problem	74	Internal supply voltage too high
4	Too many restarts	36	Discharge valve leakage	75	Internal supply voltage too low
5	Regenerative braking	37	Suction valve leakage	76	Internal communication fault
6	Mains fault	38	Vent valve defective	77	Communication fault, twin-head pump
7	Too many hardware shutdowns	40	Undervoltage	78	Fault, speed plug
8	PWM switching frequency reduced	41	Undervoltage transient	79	Functional fault, add-on module
9	Phase sequence reversal	42	Cut-in fault (dV/dt)	80	Hardware fault, type 2
10	Communication fault, pump	45	Voltage asymmetry	81	Verification error, data area (RAM)
11	Water-in-oil fault (motor oil)	48	Overload	82	Verification error, code area (ROM, FLASH)
12	Time for service (general service information)	49	Overcurrent (i_line, i_dc, i_mo)	83	Verification error, FE parameter area (EEPROM)
13	Moisture alarm, analog	50	Motor protection function, general shutdown (MPF)	84	Memory access error
14	Electronic DC-link protection activated (ERP)	51	Blocked motor/pump	85	Verification error, BE parameter area (EEPROM)
15	Communication fault, main system (SCADA)	52	Motor slip high	88	Sensor fault
16	Other	53	Stalled motor	89	Signal fault, (feedback) sensor 1
17	Performance requirement cannot be met	54	Motor protection function, 3 sec. limit	90	Signal fault, speed sensor
18	Commanded alarm standby (trip)	55	Motor current protection activated (MCP)	91	Signal fault, temperature 1 sensor
19	Diaphragm break (dosing pump)	56	Underload	92	Calibration fault, (feedback) sensor
20	Insulation resistance low	57	Dry running	93	Signal fault, sensor 2
21	Too many starts per hour	58	Low flow	94	Limit exceeded, sensor 1
22	Moisture switch alarm, digital	59	No flow	95	Limit exceeded, sensor 2
23	Smart trim gap alarm	60	Low input power	96	Setpoint signal outside range
24	Vibration	64	Overtemperature	97	Signal fault, setpoint input
25	Setup conflict	65	Motor temperature 1 (t_m or t_mo or t_mo1)	98	Signal fault, input for setpoint influence
26	Load continues even if the motor has been switched off	66	Temperature, control electronics (t_e)	99	Signal fault, input for analog setpoint
27	External motor protector activated (e.g. MP 204)	67	Temperature too high, internal frequency converter module (t_m)	104	Software shutdown
28	Battery low	68	External temperature/water temperature (t_w)	105	Electronic rectifier protection activated (ERP)
29	Turbine operation (impellers forced backwards)	69	Thermal relay 1 in motor (e.g. Klixon)	106	Electronic inverter protection activated (EIP)
30	Change bearings (specific service information)	70	Thermal relay 2 in motor (e.g. thermistor)	110	Skew load, electrical asymmetry
31	Change varistor(s) (specific service information)	71	Motor temperature 2 (Pt100, t_mo2)	111	Current asymmetry

Code	Description	Code	Description	Code	Description
112	Cos φ too high	167	Signal fault, analog input 3	195	Limit exceeded, sensor 6
113	Cos φ too low	168	Signal fault, pressure sensor	196	Operation with reduced efficiency
120	Auxiliary winding fault (single-phase motors)	169	Signal fault, flow sensor	197	Operation with reduced pressure
121	Auxiliary winding current too high (single-phase motors)	170	Signal fault, water-in-oil (WIO) sensor	198	Operation with increased power consumption
122	Auxiliary winding current too low (single-phase motors)	171	Signal fault, moisture sensor	199	Process out of range (monitoring/ estimation/calculation/control)
123	Start capacitor, low (single-phase motors)	172	Signal fault, atmospheric pressure sensor	200	Application alarm
124	Run capacitor, low (single-phase motors)	173	Signal fault, rotor position sensor (Hall sensor)	201	External sensor input high
144	Motor temperature 3 (Pt100, t_mo3)	174	Signal fault, rotor origo sensor	202	External sensor input low
145	Bearing temperature high (Pt100), in general or top bearing	175	Signal fault, temperature 2 sensor (t_mo2)	203	Alarm on all pumps
146	Bearing temperature high (Pt100), middle bearing	176	Signal fault, temperature 3 sensor (t_mo3)	204	Inconsistency between sensors
147	Bearing temperature high (Pt100), bottom bearing	177	Signal fault, Smart trim gap sensor	205	Level float switch sequence inconsistency
148	Motor bearing temperature high (Pt100) in drive end (DE)	178	Signal fault, vibration sensor	206	Water shortage, level 1
149	Motor bearing temperature high (Pt100) in non-drive end (NDE)	179	Signal fault, bearing temperature sensor (Pt100), general or top bearing	207	Water leakage
152	Communication fault, add-on module	180	Signal fault, bearing temperature sensor (Pt100), middle bearing	208	Cavitation
153	Fault, analog output	181	Signal fault, PTC sensor (short-circuited)	209	Non-return valve fault
154	Communication fault, display	182	Signal fault, bearing temperature sensor (Pt100), bottom bearing	210	High pressure
155	Inrush fault	183	Signal fault, extra temperature sensor	211	Low pressure
156	Communication fault, internal frequency converter module	184	Signal fault, general-purpose sensor	212	Diaphragm tank precharge pressure out of range
157	Real-time clock out of order	185	Unknown sensor type	213	VFD not ready
158	Hardware circuit measurement fault	186	Signal fault, power meter sensor	214	Water shortage, level 2
159	CIM fault (Communication Interface Module)	187	Signal fault, energy meter	215	Soft pressure build-up timeout
160	GSM modem, SIM card fault	188	Signal fault, user-defined sensor	216	Pilot pump alarm
161	Sensor supply fault, 5 V	189	Signal fault, level sensor	217	Alarm, general-purpose sensor high
162	Sensor supply fault, 24 V	190	Limit exceeded, sensor 1 (e.g. alarm level in WW application)	218	Alarm, general-purpose sensor low
163	Measurement fault, motor protection	191	Limit exceeded, sensor 2 (e.g. high level in WW application)	219	Pressure relief not adequate
164	Signal fault, LiqTec sensor	192	Limit exceeded, sensor 3 (e.g. overflow level in WW application)	220	Fault, motor contactor feedback
165	Signal fault, analog input 1	193	Limit exceeded, sensor 4 (e.g. low level in WW/tank filling application	221	Fault, mixer contactor feedback
166	Signal fault, analog input 2	194	Limit exceeded, sensor 5	222	Time for service, mixer

Code	Description	Code	Description	Code	Description
223	Maximum number of mixer starts per hour exceeded	232	Ethernet: Auto-disabled due to misuse	241	Motor phase failure
224	Pump fault (due to auxiliary component or general fault)	233	Ethernet: IP address conflict	242	Automatic motor model recognition failed
225	Communication fault, pump module	234	Back-up pump alarm	243	Motor relay has been forced (manually operated/commanded)
226	Communication fault, I/O module	235	Gas detected	244	Fault, On/Off/Auto switch
227	Combi event	236	Pump 1 fault	245	Pump continuous runtime too long
228	User-defined event	237	Pump 2 fault	246	User-defined relay has been forced (manually operated/ commanded)
229	Water on floor	238	Pump 3 fault	247	Power-on notice (device/system has been switched off)
230	Network alarm	239	Pump 4 fault	248	Fault, battery/UPS
231	Ethernet: No IP address from DHCP server	240	Lubricate bearings (specific service information)		

11. PROFIBUS address

Decimal to hexadecimal conversion table for setting of the PROFIBUS address switches. See section *5.4 Setting the PROFIBUS address*.

PROFIBUS address	SW3	SW4
1	0	1
2	0	2
3	0	3
4	0	4
5	0	5
6	0	6
7	0	7
8	0	8
9	0	9
10	0	A
11	0	B
12	0	C
13	0	D
14	0	E
15	0	F
16	1	0
17	1	1
18	1	2
19	1	3
20	1	4
21	1	5
22	1	6
23	1	7
24	1	8
25	1	9
26	1	A
27	1	B
28	1	C
29	1	D
30	1	E
31	1	F
32	2	0
33	2	1
34	2	2
35	2	3
36	2	4
37	2	5
38	2	6
39	2	7
40	2	8
41	2	9
42	2	A
43	2	B
44	2	C
45	2	D
46	2	E
47	2	F
48	3	0
49	3	1
50	3	2
51	3	3
52	3	4
53	3	5
54	3	6
55	3	7
56	3	8
57	3	9
58	3	A
59	3	B
60	3	C
61	3	D
62	3	E
63	3	F
64	4	0
65	4	1
66	4	2
67	4	3
68	4	4
69	4	5
70	4	6
71	4	7
72	4	8
73	4	9
74	4	A
75	4	B
76	4	C
77	4	D
78	4	E
79	4	F
80	5	0
81	5	1
82	5	2
83	5	3
84	5	4
85	5	5
86	5	6
87	5	7
88	5	8
89	5	9
90	5	A
91	5	B
92	5	C
93	5	D
94	5	E
95	5	F
96	6	0
97	6	1
98	6	2
99	6	3
100	6	4
101	6	5
102	6	6
103	6	7
104	6	8
105	6	9
106	6	A
107	6	B
108	6	C
109	6	D
110	6	E
111	6	F
112	7	0
113	7	1
114	7	2
115	7	3
116	7	4
117	7	5
118	7	6
119	7	7
120	7	8
121	7	9
122	7	A
123	7	B
124	7	C
125	7	D
126	7	E

Subject to alterations.

The appendix describes the parts of the CIM 500 web server needed for the configuration of a PROFINET IO Ethernet connection. For other CIM 500 web server features, not specifically related to PROFINET IO, see the CIM 500 Installation & Operating instructions.

A.1 How to configure an IP address on your PC

For connecting a PC to the CIM 500 via Ethernet, the PC must be set up to use a fixed (static) IP address belonging to the same subnetwork as the CIM 500.

1. Open "Control Panel".
2. Enter "Network and Sharing Center".
3. Click [Change adapter settings].
4. Right-click and select "Properties" for Ethernet adapter. Typically "Local Area Connection".
5. Select properties for "Internet Protocol Version 4(TCP/IPv4).
6. Select tab "Alternate Configuration".
7. Configure an IP address and subnet mask to be used by your PC. See fig. 14.

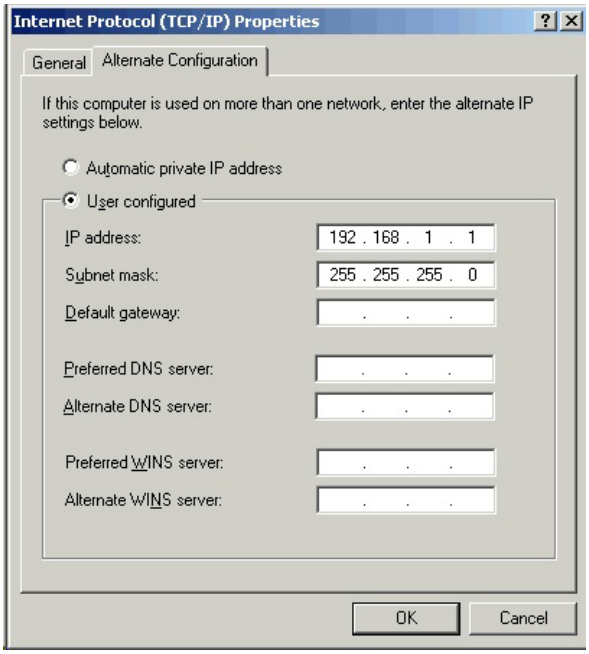

Fig. 14 Example from Windows XP

A.2 Web server configuration

The built-in web server is an easy and effective way to monitor the status of the CIM 500 module and configure the available functions and Industrial Ethernet protocols. The web server also makes it possible to update the firmware of the CIM module, and store/restore settings.

Before configuration

- Check that PC and CIM module are connected via an Ethernet cable.
- Check that the PC Ethernet port is set to the same network as the CIM module. For network configuration, see section *A.1 How to configure an IP address on your PC*.

To establish a connection from a PC to CIM 500 the first time, the following steps are required:

1. Open a standard Internet browser and type 192.168.1.100 in the URL address field.
2. Log in to the Web server.

A.3 Login

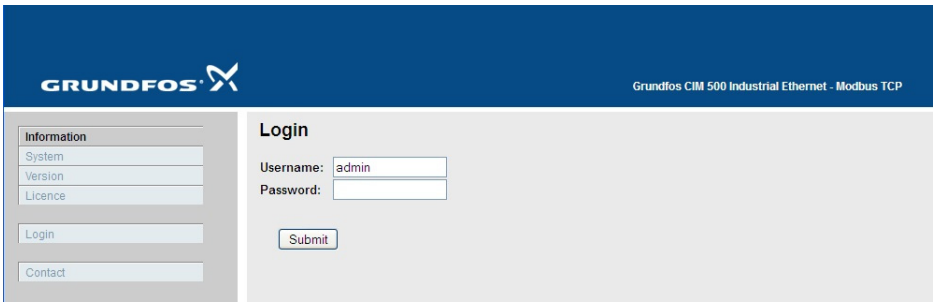

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Fig. 15 Login

User name	Enter user name. Default: admin.
Password	Enter password. Default: Grundfos.

Note ***User name and password can be changed on the web server under "Grundfos Management"***

A.4 PROFINET IO configuration

This web page is used to configure all the parameters relevant to the PROFINET IO protocol standard. All settings can also be configured from a standard PROFINET IO configuration tool, for instance Siemens Primary Setup Tool (PST). It is available on internet.

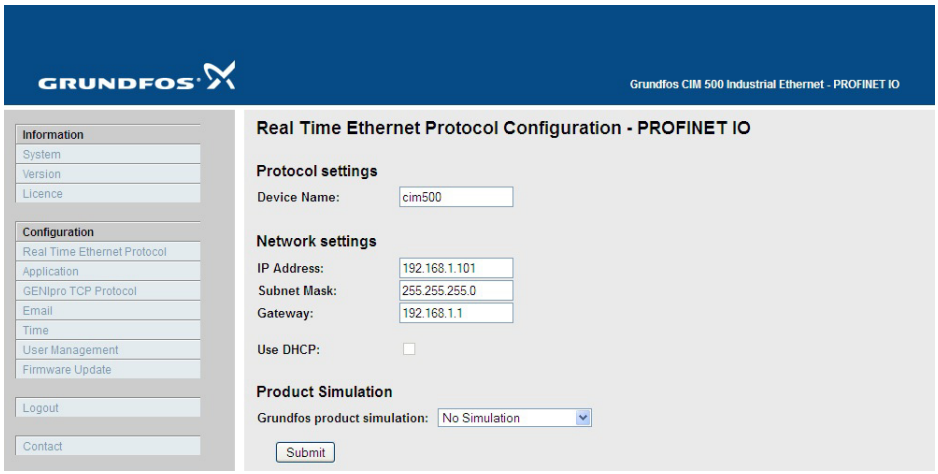

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Fig. 16 Real Time Ethernet Protocol Configuration - PROFINET IO

Object	Description
Device Name	The PROFINET IO device name. It must be unique.
IP Address	The static IP address for CIM 500 on the PROFINET IO network.
Subnet mask	Configure the subnet mask for the CIM 500 module on the PROFINET IO network.
Gateway	Configure the default gateway for the PROFINET IO network.
Use DHCP	The CIM 500 module can be configured to automatically obtain the IP address from a DHCP server on the network.
Grundfos product simulation	The CIM 500 can be put in product simulation mode to generate realistic simulated values of all the PROFINET IO input data modules. It will thus be possible to connect a PROFINET IO master to a CIM 500 fitted in a CIU or E-box without installing this device in a real industrial process system. In an office environment, it can then be verified that communication works and data are received and handled correctly by the PROFINET IO master application program (e.g. PLC program) before installing the device. To enable product simulation, select a product type from the drop down list. Product simulation will be terminated by a module power cycle.

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